

What is claimed is:

1. Apparatus for obtaining dielectric constant and other measurements of a sample, comprising:

an open cavity resonator having a pair of opposed confocal mirrors supplied with microwave energy, with each said mirror operable to provide corresponding microwave output signals for analysis for determination of said dielectric constant and other measurements;

a sample holder;

a first precision drive unit operably connected to said holder to rotate said holder, with said sample, about a vertical axis;

a second precision drive unit operably connected to said holder to tilt said holder, with said sample, relative to said mirrors;

a third precision drive unit operably connected to said holder to move said holder, with said sample, along a vertical axis;

a fourth precision drive unit operably connected to said holder to move said holder, with said sample, along a first horizontal axis toward and away from a said mirror;

a fifth precision drive unit operably connected to said holder to move said holder, with said sample, along a second horizontal axis when in said cavity of said resonator, said second horizontal axis being at a right angle with respect to said first horizontal axis;

a bearing slide;

said drive units being positioned on, and carried by said bearing slide which is moveable to position said holder into and out of said open cavity resonator.

2. Apparatus according to claim 1 wherein:

said sample holder is of a non-metallic material.

3. Apparatus according to claim 2 wherein:

said sample holder is of a plastic material.

4. Apparatus according to claim 1 wherein:

said sample holder is a ring.

5. Apparatus according to claim 4 wherein:

said confocal mirrors are circular and have a diameter  $D_M$ ;

said ring has an inner diameter  $D_R$ ; and wherein

$D_R > D_M$ .

6. Apparatus according to claim 1 wherein:

said apparatus is positioned within an environmental chamber for conducting measurements over a temperature range;

at least said first, second and fourth drive units and said bearing slide being controllable from outside of said chamber.

7. Apparatus according to claim 1 wherein:

at least one of said mirrors includes a precision drive unit.

8. Apparatus according to claim 6 wherein:

said first, second and fourth drive units are controlled by respective cables which pass through an aperture in said chamber.

9. Apparatus according to claim 8 wherein:

said bearing slide is moveable by a rod which passes through said aperture.